

In the Claims:

Please add new claims 62-90.

Following is a complete listing of the claims pending in the application, as amended:

1-25. (Cancelled)

26. (Previously presented) A reactor for electrochemically processing a microelectronic workpiece comprising:

one or more walls defining a processing space for containing a processing fluid,
the one or more walls forming a processing cup having an open top;

a microelectronic workpiece support including one or more conductive members disposed to electrically contact the microelectronic workpiece to provide electrical power for electrochemical processing of the microelectronic workpiece, the microelectronic workpiece support being disposed proximate the open top of the processing cup to bring at least one portion of the microelectronic workpiece into contact with the processing fluid for electrochemical processing,

an electrode housing disposed in the processing cup and having an end that opens toward the microelectronic workpiece support, the electrode housing having an interior region configured to receive at least one electrode;

a pressure drop member disposed over the open end of the electrode housing;
at least one processing fluid inlet disposed exterior to the interior region of the electrode housing to provide a flow of the processing fluid into the processing space;

at least one processing fluid outlet in fluid communication with the interior region of the electrode housing to generate a flow of the processing fluid through the pressure drop member and into the interior region of the electrode housing.

27. (Previously presented) A reactor as claimed in claim 26, further comprising the at least one electrode, and wherein the at least one electrode comprises an anode in the electrochemical processing of the microelectronic workpiece.

28. (Previously presented) A reactor as claimed in claim 26, further comprising the at least one electrode, and wherein the at least one electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece.

29. (Original) A reactor as claimed in claim 26 wherein the at least one processing fluid outlet draws at least a portion of the flow of the processing fluid about the at least one electrode as the processing fluid exits from the interior region.

30. (Original) A reactor as claimed in claim 26 wherein at least a portion of the processing fluid entering the processing space exits from the processing space through the open top of the processing cup.

31. (Original) A reactor as claimed in claim 26 wherein the pressure drop member comprises a permeable membrane.

32. (Original) A reactor as claimed in claim 31 wherein, the permeable membrane is conical in shape having an apex directed toward the interior region of the electrode housing.

33. (Original) A reactor as claimed in claim 26 wherein the pressure drop member is conical in shape having an apex directed toward the interior region of the electrode housing.

34. (Previously presented) An apparatus for use in a reactor assembly used in electrochemical processing of a microelectronic workpiece, the apparatus comprising:
one or more walls defining a processing space therebetween for containing a processing fluid;

- a pressure drop member disposed in the processing space to divide the processing space into at least a first fluid flow region and a second fluid flow region, the pressure drop member facilitating generation of a pressure drop thereacross, fluid flow during electrochemical processing of the microelectronic workpiece being from the second region into the first region across the pressure drop member, the first fluid flow region being configured to receive at least one electrode; and
- a microelectronic workpiece disposed for contact with processing fluid in the second fluid flow region.

35. (Previously presented) A reactor as claimed in claim 34, further comprising the at least one electrode, and wherein the at least one electrode comprises an anode in the electrochemical processing of the microelectronic workpiece.

36. (Previously presented) A reactor as claimed in claim 34, further comprising the at least one electrode, and wherein the at least one electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece.

37. (Original) An apparatus as claimed in claim 34 wherein the pressure drop member comprises a permeable membrane.

38. (Original) An apparatus as claimed in claim 34 wherein the first and second fluid flow regions are adjacent one another.

39-41. (Cancelled)

42. (Original) A method for electrochemically processing a microelectronic workpiece comprising the steps of:

- dividing a processing space containing processing fluid into at least a first fluid flow region and a second fluid flow region,
- locating a first electrode within the processing fluid of the first fluid flow region;

locating a second electrode comprising at least a portion of the microelectronic workpiece within the processing fluid of the second fluid flow region;
generating a fluid flow of the processing fluid within the first fluid flow region that is generally directed toward the first electrode and generally away from the second electrode; and
generating a fluid flow of the processing fluid within the second fluid flow region that is generally directed toward the second electrode and generally away from the first electrode.

43. (Original) A method as claimed in claim 42 and further comprising the step of providing a negative potential to the first electrode with respect to the second electrode.

44. (Original) A method as claimed in claim 42 and further comprising the step of providing a negative potential to the second electrode with respect to the first electrode.

45. (Original) A method as claimed in claim 42 wherein the step of generating the fluid flow of the processing fluid within the second fluid flow region comprises the step of supplying processing fluid from a fluid reservoir into the second fluid flow region of the processing space

46. (Original) A method as claimed in claim 42 wherein the step of generating the fluid flow of the processing fluid within the first fluid flow region comprises the step of exhausting at least a portion of the processing fluid from the first fluid flow region away from the processing space.

47. (Original) A method as claimed in claim 42 and further comprising the step of limiting the flow of processing fluid from the second fluid flow region into the first fluid flow region, thereby maintaining a pressure differential between the first fluid flow region and the second fluid flow region.

48. (Original) A method as claimed in claim 47 wherein the step of limiting the flow comprises the step of providing a permeable membrane between the first fluid flow region and the second fluid flow region.

49. (Original) An apparatus for use in electrochemical processing of a microelectronic workpiece comprising:

- a processing space containing processing fluid;
- at least one fluid inlet disposed to provide a flow of processing fluid to the processing space;
- an electrode assembly disposed in the processing space comprising an electrode housing having an open end,
- a pressure drop member disposed over the open end of the electrode housing, the electrode housing and pressure drop member defining an interior electrode chamber,
- an electrode disposed in the interior electrode chamber,
- at least one fluid outlet in fluid communication with the interior electrode chamber to thereby draw a flow of processing fluid through the pressure drop member and into the interior electrode chamber.

50. (Original) An apparatus as claimed in claim 49 wherein the pressure drop member comprises a permeable membrane.

51. (Original) An apparatus as claimed in claim 50 and further comprising a membrane frame disposed over the open end of the electrode housing, the permeable membrane being connected to the membrane frame.

52. (Original) An apparatus as claimed in claim 49 wherein the pressure drop member has a conical shape with an apex directed toward the interior electrode chamber.

53. (Previously presented) A reactor for electrochemically processing a microelectronic workpiece, comprising:

- a chamber having a processing space configured to receive a processing fluid;
- at least one fluid inlet positioned to provide a flow of processing fluid to the processing space;
- a workpiece support positioned to carry a microelectronic workpiece in contact with processing fluid in the processing space, the workpiece support including at least one conductive member disposed to electrically contact a microelectronic workpiece;
- an electrode support positioned in fluid communication with the processing space and being configured to carry an electrode;
- a permeable membrane positioned between the electrode support and the workpiece support;
- a porous flow distribution element positioned between the permeable membrane and the workpiece support; and
- a shield positioned between the flow distribution element and the workpiece support.

54. (Previously presented) The reactor of claim 53 wherein the permeable membrane is permeable to an ionic species in the processing fluid.

55. (Previously presented) The reactor of claim 53 wherein the permeable membrane has a generally conical shape, with an edge region of the permeable membrane disposed closer than a central region of the permeable membrane to the workpiece support.

56. (Previously presented) The reactor of claim 53 wherein the flow distribution element includes a multitude of openings through which the processing fluid can flow.

57. (Previously presented) The reactor of claim 53 wherein the shield includes a rim and an opening disposed annularly inwardly from the rim.

58. (Previously presented) The reactor of claim 53 wherein the shield is part of a field shaping element.

59. (Previously presented) The reactor of claim 53, further comprising the microelectronic workpiece.

60. (Previously presented) The reactor of claim 53, further comprising the processing fluid.

61. (Previously presented) The reactor of claim 53, further comprising an electrode carried by the electrode support.

62. (New) A reactor for electrochemically processing a microelectronic workpiece, comprising:

- a reactor vessel configured to contain an electrochemical processing fluid;
- a workpiece support proximate to the reactor vessel;
- an electrode located within the reactor vessel;
- a ring field shaping element located within the reactor vessel; and
- a diffuser located within the reactor vessel between the electrode and the ring field shaping element.

63. (New) The reactor of claim 62, further comprising an electrode compartment located within, and in fluid communication with, the reactor vessel, the electrode being located within the electrode compartment .

64. (New) The reactor of claim 63, further comprising a membrane in fluid communication with the electrode compartment and with the reactor vessel, the membrane being located between the electrode and the ring field shaping element.

65. (New) The reactor of claim 64 wherein the membrane is located between the electrode and the diffuser.

66. (New) A reactor for electrochemically processing a microelectronic workpiece comprising:

- a reactor vessel configured to contain an electrochemical processing fluid;
- a workpiece support;
- an electrode located within the reactor vessel;
- a ring field shaping element located within the reactor vessel;
- an electrode compartment located within, and in fluid communication with, the reactor vessel, the electrode being located within the electrode compartment.

67. (New) The reactor of claim 66, further comprising a membrane in fluid communication with the electrode compartment and with the reactor vessel, the membrane being located between the electrode and the ring field shaping element.

68. (New) A reactor for electrochemically processing a microelectronic workpiece, comprising:

- a reactor vessel for containing an electrochemical processing fluid;
- a workpiece support;
- an electrode support located within the reactor vessel;
- a ring field shaping element located within the reactor vessel; and
- a diffuser located within the reactor vessel between the electrode support and the ring field shaping element.

69. (New) The reactor of claim 68 wherein the diffuser includes a multitude of perforations.

70. (New) The reactor of claim 68 wherein the diffuser is positioned above the electrode support and wherein the ring field shaping element is positioned above the diffuser.

71. (New) The reactor of claim 68 wherein the chamber has a generally circular cross-sectional shape includes a centrally located fluid inlet.

72. (New) The reactor of claim 71 wherein the fluid inlet is positioned to direct the processing fluid radially outwardly in the chamber.

73. (New) The reactor of claim 68 wherein the workpiece support includes at least one conductive member positioned to electrically contact an outer region of a microelectronic workpiece.

74. (New) The reactor of claim 68 wherein a microelectronic workpiece carried by the workpiece support includes an inner region and an outer region, and wherein an opening of the ring field shaping element is aligned with the inner region.

75. (New) The reactor of claim 68 wherein the workpiece support is movable axially toward and away from the electrode support.

76. (New) The reactor of claim 68 wherein the workpiece support is movable axially toward and away from the electrode support along an axis, and wherein the workpiece support is rotatable about the axis to spin the workpiece.

77. (New) The reactor of claim 68, further comprising an anode carried by the electrode support.

78. (New) The reactor of claim 68, further comprising a membrane in fluid communication with the electrode compartment and with the reactor vessel, the

membrane being located between the electrode support and the ring field shaping element.

79. (New) The reactor of claim 68, further comprising a membrane in fluid communication with the electrode compartment and with the reactor vessel, the membrane being located between the electrode support and the diffuser.

80. (New) The reactor of claim 68, further comprising:
an anode carried by the electrode support; and
a porous membrane positioned between the diffuser and the anode, the porous membrane having a generally conical shape with a central portion of the porous membrane positioned closer to the anode than is an outer portion of the porous membrane.

81. (New) The reactor of claim 68, further comprising an electrode compartment located within, and in fluid communication with, the reactor vessel, the electrode support being located within the electrode compartment .

82. (New) A reactor for electrochemically processing a microelectronic workpiece comprising:
a reactor vessel for containing an electrochemical processing fluid;
a workpiece support;
an electrode support located within the reactor vessel;
a ring field shaping element located within the reactor vessel;
an electrode compartment located within, and in fluid communication with, the reactor vessel, the electrode support being located within the electrode compartment.

83. (New) The reactor of claim 82 including a membrane in fluid communication with the electrode compartment and with the reactor vessel, the

membrane being located between the electrode support and the ring field shaping element.

84. (New) A method for electrochemically processing a microelectronic workpiece, comprising:

providing an electrochemical processing fluid in a reactor vessel with the electrochemical processing fluid in fluid communication with an electrode in the reactor vessel, a ring field shaping element in the reactor vessel, and a diffuser between the electrode and the ring field shaping element;

supporting a microelectronic workpiece in contact with an electrochemical processing fluid; and

directing an electrical current to flow between the microelectronic workpiece and the electrode.

85. (New) The method of claim 84, further comprising aligning a central portion of the microelectronic workpiece with a central opening of the ring field shaping element.

86. (New) The method of claim 84, further comprising passing at least a portion of the electrochemical processing fluid through a membrane positioned between the electrode and the diffuser.

87. (New) The method of claim 84, further comprising passing at least a portion of the electrochemical processing fluid through a membrane positioned between the electrode and the ring field shaping element.

88. (New) The method of claim 84 wherein directing an electrical current includes directing an electrical current to apply material to a surface of the microelectronic workpiece.

89. (New) The method of claim 84, further comprising providing relative rotational motion between the microelectronic workpiece and the ring field shaping unit while the microelectronic workpiece contacts the electrochemical processing fluid.

90. (New) The method of claim 84, further comprising shielding electrical current from a peripheral region of the microelectronic workpiece with the ring field shaping element.